

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Investigation into the
November 2018 Submission of
Southern California Edison Risk
Assessment and Mitigation Phase.

Investigation 18-11-006

**COMMENTS OF THE PUBLIC ADVOCATES OFFICE
ON NOVEMBER 2018 SUBMISSION OF SOUTHERN CALIFORNIA EDISON
COMPANY'S RISK ASSESSMENT AND MITIGATION PHASE**

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I. INTRODUCTION

Pursuant to Rule 14.3 of the Rules of Practice and Procedure of the California Public Utilities Commission (Commission), the Public Advocates Office at the California Public Utilities Commission (Cal Advocates) submits these comments on Southern California Edison Company's (SCE) 2018 Risk Assessment and Mitigation Phase (RAMP) Report, filed on November 15, 2018 in Order Instituting Investigation (I.)18-11-006.

II. SUMMARY

The SCE RAMP Report was submitted ahead of SCE's 2021 General Rate Case (GRC) application, which is anticipated to be filed in September 2019. While the Public Advocates Office offers many suggestions and critiques, the Public Advocates Office acknowledges that the RAMP (and similarly, the Safety Model Assessment Proceeding or S-MAP) process is one of ongoing development and learning for all parties. While some of the Public Advocates Office's comments may overlap with issues discussed in the S-MAP proceeding,¹ our comments are intended as suggestions for improvement based primarily on SCE's RAMP Report. SCE's RAMP Report is a reasonable starting point upon which the Commission and other Investor-Owned Utilities (IOUs) can expand in future RAMPs.

The Public Advocates Office's comments are organized as follows:²

- 1) Section III provides the Public Advocates Office's general comments on themes, concerns, or topics not specific to the nine risks presented by SCE; and
- 2) Section IV contains the Public Advocates Office's comments on specific aspects of the nine risks.

In keeping with the understanding that the RAMP is an evolving process, and that this is SCE's first RAMP filing, the Public Advocates Office's evaluation is not intended to be a comprehensive review of SCE's 2018 RAMP. Therefore, comments or lack thereof should not be interpreted to be a definitive and/or comprehensive position on a specific risk, risk category, or risk-analysis approach.

¹ The Safety Model Assessment Proceeding Applications (A.)15-05-002, et al.

² A summary of the Public Advocates Office's comments is presented in Table 1, starting on p. 2.

Table 1: Summary of Public Advocates Office Recommendations

Recommendation	SCE RAMP Chapter	Cal Advocates Comments Section	Recommended Timing³
SCE should readjust the weights of risk consequence categories to ensure that its implicit valuation of its consequence matches its actual valuation.	General	III A 1	Next RAMP
SCE should consider adding environmental consequence as a consequence category.	General	III A 2	Next RAMP
SCE should use data from historical data with consistent year ranges and explain the year ranges utilized.	General	III A 3	Next RAMP
SCE should quantify secondary indirect impacts of risks.	General	III A 4	2019 GRC and Next RAMP
SCE should employ methods to account for uncertainty.	General	III A 5	2019 GRC
SCE should focus its mitigations on the most affected areas.	General	III B 1	2019 GRC
SCE should optimize risk reduction spending.	General	III C 1	2019 GRC
SCE should develop a risk tolerance value.	General	III C 2	Next RAMP
SCE should consider increasing existing controls, besides proposing new mitigations. However, consideration of existing controls should not be used in substitute of considering new mitigations.	General	III C 3	2019 GRC
For each risk SCE should have performance metrics that track SCE's efforts to reduce the risk and the actual risk reduction.	General	III D 1	2019 GRC
SCE should present the RSEs of each overall mitigation plan separate from its existing controls.	General	III D 2	2019 GRC
SCE should restructure the risks addressed in its appendix chapters to more closely match the SCE RAMP Report's main chapters.	General	III D 3	Next RAMP
SCE should provide a list of mitigations it has already considered and rejected.	General	III D 4	2019 GRC
SCE should track and report the changes to its GRC based on the RAMP comments filed by SED and parties.	General	III D 5	2019 GRC

³ The Public Advocates Office anticipates SCE's next RAMP filing will be in 2021 or 2022, depending on the number of attrition years adopted in SCE's Test Year 2021 GRC.

Recommendation	SCE RAMP Chapter	Cal Advocates Comments Section	Recommended Timing³
SCE should avoid using non-linear equations when calculating MARS values based on consequence attributes.	2. Risk Model	III A 5	Next RAMP
SCE should validate the risk model by fitting estimated results with historical data with respect to different risk areas (e.g. number of wildfire occurrences).	2. Risk Model	III A 6	2019 GRC
SCE should address the issue of limited data by acquiring historical data and real-time data that enable the validation of its risk models and predictive analytics.	2. Risk Model	III A 6	Next RAMP
SCE should leverage inversion or data assimilation to improve predictive power of risk models.	2. Risk Model	III A 6	Next RAMP
SCE should quantify mitigation benefits that extend beyond the 6-year RAMP outlook within RSE scores.	2. Risk Model	III B 2	Next RAMP
SCE should account for the high uncertainty of the risks identified by the "extreme wind" driver.	4. Building Safety	IV A	2019 GRC
SCE should establish a risk reduction performance metric for each of its building safety risk drivers.	4. Building Safety	IV A	2019 GRC
SCE should provide its rationale when it plans to implement mitigations with low RSEs.	4. Building Safety	IV A	Next RAMP
SCE should utilize other utilities' data on areas that experience high contact with energized equipment.	5. Contact with Energized Equipment	IV B	2019 GRC
SCE should collaborate with CalFire & CalOES to assess areas with overhead equipment susceptible to failure on evacuation routes where there is only one evacuation route.	5. Contact with Energized Equipment	IV B	2019 GRC and 2020 Wildfire Mitigation Plan
SCE should discuss the interactions of the Power Safety Power Shutoff (PSPS) in the Contact with Energized Equipment risk chapter.	5. Contact with Energized Equipment	IV B	Next RAMP
SCE should clearly identify related compliance and control measures and the costs and effectiveness for those measures to ensure appropriate accounting and risk reduction.	6. Cyberattack	IV C	2019 GRC

Recommendation	SCE RAMP Chapter	Cal Advocates Comments Section	Recommended Timing³
SCE should opt for expanded training in Mitigation M1b instead of core training in Mitigation M1a. SCE should also include Mitigation M4a.	7. Employee, Contractor, and Public Safety	IV D	2019 GRC
SCE should evaluate and present potential consequences for actions without adverse outcomes. Events without adverse outcomes may represent near-miss events.	7. Employee, Contractor, and Public Safety	IV D	Next RAMP
SCE should develop a metric for light injury in the workplace.	7. Employee, Contractor, and Public Safety	IV D	Next RAMP
SCE should actively solicit and utilize workers' input for data collection.	7. Employee, Contractor, and Public Safety	IV D	Next RAMP
SCE must prove that non-compliance controls are indeed above and beyond what are already required by law the regulations.	8. Hydro Asset	IV E	2019 GRC
SCE should carry out more field investigations and leverage numerical simulations to inform the risk of high-hazard dams.	8. Hydro Asset	IV E	Next RAMP
SCE should identify related compliance and control measures and the costs and effectiveness for those measures to ensure appropriate accounting and risk reduction.	9. Physical Security	IV F	Next RAMP
SCE should include ignition data outside of HFRA.	10. Wildfire	IV G	2019 GRC and 2020 Wildfire Mitigation Plan
SCE should include a similar incidents category (for near miss tracking).	10. Wildfire	IV G	2019 GRC
SCE should include guidelines its staff follows to ensure proper classification of incidents to minimize the use of Driver 4 Unknown/Unspecified in the next RAMP filing.	10. Wildfire	IV G	Next RAMP
The CPUC and CalFire should host a workshop to determine more valuable data granularity that can be used by California utilities.	10. Wildfire	IV G	During 2019

Recommendation	SCE RAMP Chapter	Cal Advocates Comments Section	Recommended Timing³
The CPUC should solicit further discussion of the following topics: 1. Tree Attachments, specifically for the 2019 and 2020 fire seasons; 2. Public Safety Power Shutoff (PSPS) strategy; 3. Fire Spreading; and 4. Overhead Conductor Program.	10. Wildfire	IV G	2019 GRC
SCE should include outcome-based metrics for wildfire risk and wildfire risk reduction.	10. Wildfire	IV G	2019 GRC
SCE should show specific details on locations of the proposed mitigations and how it would be implemented.	11. Underground Equipment Failure	IV H	2019 GRC
SCE should have performance metrics that track risk reduction from its mitigations.	12. Climate Change	IV I	2019 GRC
SCE should quantify the risk from climate change-caused wildfires that are less than 300 acres.	12. Climate Change	IV I	2020 Wildfire Mitigation Plan
SCE should reevaluate whether it misclassifies "drivers" as "outcomes."	12. Climate Change	IV I	Next RAMP
SCE should also quantify the non-wildfire benefits of M2: Situational Awareness, Monitoring & Analytics.	12. Climate Change	IV I	Next RAMP
SCE should consider performing analysis for long-term mitigations.	12. Climate Change	IV. I	Next RAMP
SCE should account for the high uncertainty related to its regression equations used to predict the frequency of climate change-related drivers.	12. Climate Change	IV I	2019 GRC
SCE should provide information with greater granularity of the outcomes and consequences of climate change-related events.	12. Climate Change	IV I	Next RAMP
SCE should ensure that all mitigations that were considered in SCE's Climate Impact Analysis and Resilience Planning Report are also considered in SCE's RAMP Reports.	12. Climate Change	IV I	Next RAMP
SCE should provide quantitative evaluations in addition to the qualitative evaluations of SONGS decommissioning.	Appendix A: Nuclear Decommissioning	IV J	Next RAMP

Recommendation	SCE RAMP Chapter	Cal Advocates Comments Section	Recommended Timing³
SCE should assess environmental impacts with regards to radioactive release and site restoration.	Appendix A: Nuclear Decommissioning	IV J	Next RAMP
SCE should clarify which of its proposed measures are existing controls versus new mitigations.	Appendix B: Transmission & Substation Assets	IV K	2019 GRC
SCE should consider and present the impacts of climate change to Transmission & Substation assets.	Appendix B: Transmission & Substation Assets	IV K	Next RAMP

III. GENERAL COMMENTS

A. Multi-Attribute Risk Score (MARS) Calculation Methodology

1. Adjusting Consequence Category Weights

Currently, SCE gives a 25% weighting to each of the following maximum consequence ranges: 500 serious injuries, 100 fatalities, 2 billion customer minutes interrupted (CMI), and \$5 billion in losses.⁴ Implicitly, this values the consequences as \$10 million per serious injury (\$5 billion / 500), \$50 million per fatality (\$5 billion / 100) and \$2.50 per CMI (\$5 billion / 2 billion). To ensure that the implicit valuations of each consequence matches the actual valuation, SCE should reevaluate the 25% weightings of its consequence categories in its next RAMP filing.

Also, as required in the Phase 2 Final Decision of the S-MAP,⁵ SCE should continue to maintain a minimum 40% weighting for safety (which involves any fatalities and serious injuries) when adjusting its consequences weightings in the next RAMP and GRC filings. To demonstrate the future impacts of this change, the Public Advocates Office recommends that

⁴ SCE RAMP Report, p. 1-35.

⁵ D.18-12-014, Conclusion of Law Number 5, p. 66.

SCE provide a table in the 2019 GRC comparing the MARS scores for each of the nine risks under its current weighting and the S-MAP Phase 2 Final Decision weighting in its GRC filing.⁶ This table should be considered informational, since SCE’s RAMP filing pre-dates the Phase 2 Final Decision, which ordered this change.

2. Environmental Consequences

SCE should include environmental impacts as one of the consequence categories in its future RAMP filings, as PG&E has done in PG&E’s 2017 RAMP filing. Besides covering ecological damage, an environmental consequence category could quantify impacts to water quality and air quality. In turn, water quality and air quality have long-term impacts on human health, including the potentials for premature death.⁷ Therefore, an environmental consequence category, by quantifying the impacts from risks on water quality and air quality, may help to quantify long-term health impacts that are currently not the main focus of SCE’s fatality and injury consequence categories.

3. Inconsistent Use of Historical Data

Many of SCE’s predictions for the likelihood and consequences of various risks are based on the historical data related to these risks. However, when using historical data in this way, SCE should explain why it uses certain year ranges of historical data. For example, for the risk driver “third party contact with intact lines” in the risk area Contact with Energized Equipment, SCE uses data from the years 2008-2016.⁸ However, for the risk area for Employee, Contractor and Public Safety, SCE almost exclusively uses data from the years 2014-2017.⁹ For each risk area, SCE should clearly state why the year range of historical data was selected. For example,

⁶ The nine risks are; building safety; contact with energized equipment; cyberattack; employee, contractor and public safety; hydro asset safety; physical security; wildfire; underground equipment failure; and climate change.

⁷ E.g. Update to the California Communities Environmental Health Screening Tool, CalEnviroScreen 3.0, p. 27. Available at <https://oehha.ca.gov/media/downloads/calenviroscreen/report/ces3report.pdf>.

⁸ SCE RAMP Report, p. 5-12.

⁹ SCE RAMP Report, pp. 7-8 to 7-9.

SCE should explain if the range is driven by changes in how it manages or measures employee, contractor, or public safety.

4. Indirect Impacts

SCE has stated that in this RAMP filing, it has only considered direct primary¹⁰ safety impacts from its risk events.¹¹ When the data on secondary¹² indirect safety impacts become available, SCE should incorporate these second order impacts into the next applicable RAMP. At a minimum, in the 2019 GRC, SCE should qualitatively evaluate the magnitude of these second-order impacts and explain why they were or were not considered when SCE selected its proposed mitigation programs.

5. MARS Equations

SCE should avoid using Multi-Attribute Risk Scores (MARS) equations with non-linear relationships between the natural unit of the consequence¹³ and the MARS value. SCE used a square root function to scale its safety consequences because this “exhibits a steep slope on the lower end of the scale”, as it “reflects SCE’s intolerance for safety-related consequences”.¹⁴ However, SCE’s use of square root function reduces comparability between different risks. This should be reflected in SCE’s next RAMP filing.

For example, consider two illustrative risks, each having consequences only in the serious injury category. The first risk has a high level of predictability of events per year, at an average of one injury per year. The second risk also has an average of one injury per year, but the injury takes place on a two-year cycle. That is, in 2018, 2020, and 2022, there will be zero injuries during each of those years, while in 2019, 2021, 2023, there will be two injuries per year. When scaled by the square root function, the injury MARS for the first risk is 1.12. However, the

¹⁰ SCE RAMP Report, p. 1-26 defines primary impacts as “immediate” impacts, such as customer minutes interrupted at a traffic light due to an underground equipment failure.

¹¹ SCE RAMP Report, p. 1-19.

¹² SCE RAMP Report, p. 1-26 provides an example of secondary impacts as a car accident that happens due to a traffic light going out of service.

¹³ A natural unit is a physical unit of measurement. For example, a line down, or one acre of land burned.

¹⁴ SCE RAMP Report, p. 1-36.

injury MARS for the second risk is 0.79.¹⁵ In other words, these two risks have different MARS despite having the same magnitude of “safety-related consequences.” SCE can remedy this discrepancy by changing from a square root scaling function to a linear scaling function to better reflect the data.

This recommendation should not be construed to mean that the Public Advocates Office recommends using only linear equations in all of SCE’s MARS modeling. Our recommendation to use linear scaling functions only applies to SCE’s use of non-linear scaling functions when calculating MARS values based on the consequence attributes of serious injury and fatality.¹⁶

6. Proof of Theory

SCE should conduct and provide proof of theory in order to test the accuracy of its risk assessment model in the 2019 GRC. For example, SCE can validate how well its risk model fits with the historical data. Inversion or data assimilation are some of the ways to do so.

For example, assume that SCE possesses observed weather data from 1990 to 2019. For the purposes of this exercise, SCE could treat the 1990 to 2010 data (rather than from 1990 to 2019) as the “historical” data in creating a model. The model could then be used to predict what will happen in the “future” from 2010 to 2019 when estimating the frequency of rainstorm events or increased temperatures. SCE could then compare these estimated figures with the actual data from 2010 to 2019 in order to have an idea of the accuracy of the risk model. With the sense of accuracy in mind, SCE can then forecast the future risk (i.e. from 2019 onwards).

¹⁵ SCE’s exact MARS equation was empirically derived from SCE’s response to Public Advocates Office’s DR 01 Q01 Atch “RAMP Model Data Request” subfolder “Chapter 4 Building Safety” Excel file “BUS_Results_ValuesOnly”. The exact equation in a scenario where injury is the only consequence is:

$$MARS_j = \frac{1}{N} \sum_{2018}^{2023} \sqrt{\frac{c_j}{R_j}} * W_j * 100, \text{ where:}$$

- j is the j th consequence category. In the purpose of the example this is the “serious injury” category.
- N is the number of years SCE models risks. Since SCE models risks from 2018-2023, this is equal to 6.
- c_j is the consequence in its natural units for the j th consequence, on a per year basis (e.g. injuries per year).
- R_j is the maximum range value used by SCE for the j th consequence on p. 1-35 of its RAMP report. For injuries this is equal to 500 injuries per year.
- W_j is the percent weighting for the j th consequence. SCE currently gives all consequences a weighting of 25%.

¹⁶ See SCE RAMP Report, p. 1-35.

The Public Advocates Office understands that data assimilation to construct a fully representative model is not a task that the utility can achieve in one day. That is why it is important to validate the predictive power of the risk model to ensure that the risk scores (including MARS) generated by the utility's risk model is credible.

Changes in SCE's controls and mitigations from decade to decade may make past risk data not fully predictive of MARS within the last few years. However, this proof of theory exercise should at least help determine whether the risk model is providing values within the right order of magnitude.

This proof of theory exercise is intended as a tool to help SCE improve its model and reduce discrepancies between SCE's predictive indicators (or estimated values) and historically observed data. This exercise should improve SCE's modeling so that it is as robust and transparent as possible in order to help reduce risk and increase safety.

7. Methods to Account for Predictions with a High Degree of Uncertainty Associated with Infrequent Events and Limited Data Availability

SCE's RAMP often attempts to predict the risks of infrequent events that have limited data availability.¹⁷ This combination of infrequent events and limited data availability creates a high degree of uncertainty. Regarding predictions with a high degree of uncertainty, SCE should employ methods such as sensitivity analysis and uncertainty propagation to better account for that uncertainty, and to better inform its decision-making. SCE can also account for uncertainty by bolstering its data set of infrequent events through tracking occurrences of near misses.¹⁸ SCE should develop this data for use in the next RAMP filing.

¹⁷ The risk assessment of SCE's hydro assets is an example of risks with limited available data due to low frequency of risk events.

¹⁸ The tracking of near misses is often inherent to a robust safety management system. See, for example, <https://www.ehsinsight.com/blog/near-miss-reporting-a-proactive-approach-to-safety-management>

B. Mitigation and Risk Spend Efficiency (RSE) Calculations

1. Focusing Mitigations on Most Affected Areas

SCE should consider whether certain mitigations would be more efficient if they were focused on communities that are disproportionately affected by the risk that is mitigated by the measure, rather than implementing the mitigation on a service territory-wide level. For example, SCE's wildfire mitigations include enhanced situational awareness,¹⁹ which attempts to provide advanced and quicker warning of wildfires and wildfire conditions and, therefore, may provide added safety benefits to communities with a large population of people with access and functional needs.^{20 21} For example, 60 percent of the 2018 Camp Fire fatalities were elderly persons 70 years of age or older.²²

SCE could model the effects of focusing mitigations on certain communities, instead of having a service territory-wide implementation by splitting mitigations into two sub-mitigations (one mitigation for the high priority areas, and another for the lower priority areas). This is similar to SCE's approach for its Climate Change Risk²³ with two different mitigation programs.²⁴

¹⁹ SCE RAMP Report, p. 10-37 to 10-39.

²⁰ The California Governor's Office of Emergency Services (CalOES) defines Access and Functional Needs as individuals who are or have (see, <https://www.caloes.ca.gov/schools-educators/plan-prepare/access-functional-needs>):

- Physical, developmental, or intellectual disabilities
- Chronic conditions or injuries
- Limited English proficiency
- Older adults
- Children
- Low income, homeless, and/or transportation disadvantaged (i.e., dependent on public transit)
- Pregnant women

²¹ Some of these issues are also being examined more fully in other proceedings at the Commission, notably R.18-10-007, the Order Instituting Rulemaking to Implement Electric Utility Wildfire Mitigation Plans Pursuant to Senate Bill 901 (2018) (OIR); and R.18-12-005, the Order Instituting Rulemaking to Examine Electric Utility De-Energization of Power Lines in Dangerous Conditions.

²² LA Times, December 18, 2018. "Many victims of California's worst wildfire were elderly and died in or near their homes, new data show." <https://www.latimes.com/local/lanow/la-me-ln-paradise-fire-dead-map-20181213-story.html>

²³ SCE RAMP Report, Chapter 12.

²⁴ SCE RAMP Report, pp. 12-31 to 12-35, where SCE has two climate change mitigation programs for different

To prevent distorting the results of SCE's metrics, SCE should also set different performance metrics which account for mitigation efforts in high priority areas versus low priority areas when implementing this recommendation.

This analysis and approach should be provided in SCE's 2019 GRC filing.

2. Quantifying Benefits of Long-Life Mitigations

SCE's current approach of calculating mitigation RSEs based only the Mitigated Risk Reductions (MRR) from 2018-2023 does not quantify the MRR of mitigations from 2024 onwards. This causes mitigations with long lifetimes, in particular, to have artificially low RSEs relative to their lifetime MRR.²⁵

SCE should consider methods in the next RAMP to quantify the benefits of mitigations that provide benefits post-2023, for example by applying a scaling function based on the designed life of the mitigation programs.

SCE should also report the designed life and the estimated remaining useful life of each family of non-compliance controls and mitigations²⁶ (based on the relevant capital investment). This would give an indicator of the long-term risk-reduction benefits brought by these control and mitigation programs and assets.

C. Mitigation Decision Making

1. Optimization

The Commission in 2016 directed the utilities to conduct optimization techniques, and clearly identify and quantify the key constraints.²⁷ Consistent with this, SCE should demonstrate this optimization in its GRC filing, which is anticipated later this year.

service territories. The two programs are M2a: Situational Awareness, Monitoring & Analytics (Optimal) and M2b: Situational Awareness, Monitoring & Analytics (Max).

²⁵ SCE RAMP Report, pp. 4-24, examines Building Replacement, as a potential mitigation. SCE RAMP Report p. 5-2 also examines Covered Conductors as a potential mitigation. These are examples of mitigations that SCE considered that may have lifetimes far exceeding the 6-year risk period examined in its RAMP.

²⁶ SCE RAMP Report, p. 8A-15, where SCE reported the design life of each of non-compliance control and mitigation programs, but SCE does not report the estimated remaining useful life of these programs.

²⁷ Decision (D.)16-08-018, Conclusions of Law Number 18, p. 190.

Optimization can be carried out in the form of achieving a defined goal of risk reduction with a given set of time and resource constraints (e.g. capital and human resources).

a) Using RSE to Optimize Spending Across Risks

As SCE's MARS and RSE calculations become more refined, SCE should increasingly use RSEs to focus on more cost-effective mitigations. Currently there is a high level of variance in SCE's proposed mitigations, from a low value of 0.00001 for Fire Safety Portfolio Assessment to a high value of 0.855 for Cover Pressure Relief and Restraint Program.²⁸ A low number means more resources are needed for each "point" of risk reduction. SCE should holistically consider a variety of factors that influence mitigations, such as inaccuracies in RSE calculations, unquantifiable external costs and benefits from different mitigations, and logistical implementation limitations. As RSEs become more accurate, SCE should be able to increasingly rely on RSE values to select mitigations, and thus have most of its proposed mitigations have relatively high RSE values.

2. Risk Tolerance

SCE should have a risk tolerance value in order to create transparency regarding how much SCE plans to mitigate risks. The risk tolerance can take the form of a MARS threshold (i.e. SCE will mitigate its top risks until the combined MARS is below the threshold), or an RSE threshold (i.e. SCE will generally implement all mitigations above a certain RSE value, and generally will not implement mitigations with RSEs below the value). SCE currently has an implied RSE threshold based on the way SCE weights its risk consequence categories: currently, every additional \$200 million of financial impact increases MARS by 1, or put another way, every MARS increment of 0.005 is equivalent to \$1 million in financial risk ($1 / 200$).²⁹ Since

²⁸ SCE RAMP Report, pp. 4-31 & 11-24.

²⁹ SCE RAMP Report, pp. 1-34 to 1-36, where SCE's financial category has a maximum range of \$5 billion and has a linear 25% weight of a maximum MARS of 100. $100 * 25\% = \text{maximum } 25 \text{ MARS contribution from the financial consequence. } \$5 \text{ billion} / 25 = \200 million.

RSE is calculated by MARS mitigated divided by cost in millions of dollars,³⁰ a mitigation with an RSE of 0.005 is expected to reduce \$1 million in financial risk (or equivalent risk of a different consequence) per \$1 million spent. From this perspective, it is most effective for SCE to implement mitigations with an RSE greater than 0.005, and generally less effective for mitigations with an RSE less than 0.005.

It is not clear whether SCE intentionally developed its MARS calculation methodology to have this implicit 0.005 RSE threshold. SCE should revise its MARS calculation, consequence ranges, and weightings to ensure that the RSE threshold SCE finds acceptable is consistent with the implied RSE threshold in its MARS calculation methodology in the next RAMP filing.

3. Consideration of Increased Control Measures as Mitigation Measures

SCE's has made a clear distinction among compliance controls, existing controls (i.e. non-compliance controls), and mitigations in terms of the scope of these programs.³¹ SCE should also evaluate whether increasing the level of existing control measures may also serve as effective mitigation measures, rather than only proposing new mitigation measures for its top risks. Existing controls may have lower implementation learning curves and have logistical efficiencies compared to new mitigation measures. Existing controls may have also lowered risk to an appropriate level, meaning additional mitigations are less or ineffective. Such an analysis in the 2019 GRC will help SCE conduct more meaningful and effective alternative mitigation assessments.

D. Clarity and Transparency

1. Performance Metrics

SCE should ensure that each risk has a corresponding performance metric indicating the efforts SCE has taken to mitigate the risk, as well as the actual reduction in risk starting in the

³⁰ SCE's RAMP Report, p. 2-13, which implies that RSE is calculated based on MARS mitigated divided by \$ in full, rather than \$ millions. However, SCE's chapter-by-chapter RSEs for each risk show that the value is \$ millions. For example, on p. 4-4, SCE's proposed building safety plan has a forecasted cost of \$11.5 million and has a risk reduction of 0.30. $0.30 / 11.5$ equals the computed 0.026 RSE.

³¹ SCE RAMP Report, p. 1-5.

2019 GRC. For example, in SCE’s Building Safety proposals (Chapter 4), electrical inspections are identified as a mitigating measure for electrical fires.³² It is not enough to have a performance metric only related to the number of electrical inspections carried out per year. This metric does not quantify the amount of risk reduced.³³ Instead, SCE should report the number of building electrical component failures per year as a post-mitigation performance metric.³⁴

SCE should also choose clear performance metrics related to the number of known issues per year. Continuing the Building Safety example, SCE is considering the “percentage (relative to the goal) of electrical component replacements per year.”³⁵ An increased value reported using this metric could mean two opposite phenomena: a higher risk due to more electrical component failures, or a lower risk due to SCE’s heightened diligence in electrical inspections.

Finally, for risks with infrequent events, SCE should expand its available data for reporting performance metric by tracking not only the reduction of actual events or expected outcomes from the events, but also the reduction of near misses and expected outcomes of those near misses had they progressed into triggering events. SCE should also continue to actively seek out and identify comparable utilities and assess its data to increase the quantity of data available for its assessments.

2. Additionally, SCE should Provide the RSE of Mitigations Only

SCE’s RAMP Report should provide RSEs of the combined control and mitigations and the RSE of each mitigation separately, as well as the RSE of the combined mitigations. This information would increase transparency of the value added from the incremental measures (i.e. mitigations) SCE is proposing, since there are likely overlapping impacts or diminishing safety

³² SCE RAMP Report, p. 4-25.

³³ SCE has not proposed this performance metric, and currently has no performance metrics specific to building electrical inspections. This example is illustrative only.

³⁴ SCE RAMP Report, p. 4-35.

³⁵ SCE RAMP Report, p. 4-35.

returns are multiple mitigations are applied to a given risk.³⁶ This should be presented starting with the 2019 GRC.

3. Appendix Risks

SCE should restructure the organization of the risks listed in its appendices to more closely resemble the structure of its main chapters in the next RAMP filing. Currently, the risks listed in the appendices are organized only into sub-risks, rather than explicitly identifying risk drivers, trigger events, and outcomes. Moreover, many of these appendix chapters do not state what potential outcomes (serious injury, fatality, reliability, or financial) can arise from these risks. This may result in the appendix not reflecting all sections of the main chapters; a closer organizational resemblance among the chapters will increase transparency as well as comparability between risks.

4. List of Considered Mitigations

SCE has likely considered mitigation efforts that it did not pursue further in its Proposed Plan or Alternative Plans. However, SCE does not discuss its consideration of such mitigations, so it cannot be determined if SCE has actually considered other mitigations. This creates process inefficiency and a lack of transparency because stakeholders may recommend SCE consider mitigations that SCE has already determined are infeasible. For greater transparency and efficiency, SCE should compile and provide a list of all mitigation efforts considered as part of its upcoming 2019 GRC filing. SCE should list the high-level categorizations of mitigations it identified and considered, and explain the reasons for exclusion.

5. Tracking SCE's Changes to its GRC Based on the RAMP Comments

Currently, there is no method or requirement in the RAMP process that requires the utility to identify changes, if any, the utility made in its subsequent GRC. This means that there is a lack of transparency and accountability, as the utility is free to ignore or disregard any and

³⁶ PG&E's 2017 RAMP Report I.17-11-003, p. 1-19, where PG&E presents the RSEs for the combined mitigations of each plan.

all comments by remaining silent on the issues identified. The Public Advocates Office became aware of this shortcoming during its review of the current Pacific Gas and Electric Company GRC application.³⁷

The Commission should direct SCE to provide a table listing the comments provided to in this RAMP proceeding, who provided the comments, and if SCE does not intend to address the comment, if they have addressed it (and where) in its GRC, or if SCE will address it in a future RAMP or GRC proceeding. Where SCE identifies it will address an issue raised in comments in a future RAMP or GRC proceeding, SCE should provide the status in the subsequent RAMPs and GRCs until the issue has been addressed or SCE has determined it will not address the issue.

IV. SCE RISKS

A. Building Safety

The risk of Building Safety has a baseline MARS of 2.42, ranking it 8th among all SCE risks, excluding climate change.³⁸ The total spend proposed from 2018-2023 is \$69.3 million. This risk is defined as potential safety risk to buildings owned or leased by SCE. It does not cover unmanned substations,³⁹ occupied buildings at the San Onofre Nuclear Generating Station (SONGS),⁴⁰ or a safety risk in a building not caused by the building itself (e.g. workplace violence).⁴¹

The Building Safety risk category is a conglomeration of multiple, largely independent sub-risks that all affect SCE buildings. If any of these sub-risks ever dominate this risk category, SCE should separate the sub-risk into its own risk category, so that the sub-risk can be addressed in a more focused manner.

³⁷ PG&E's Test Year 2020 GRC Application (A.) 18-12-009, Cal Advocates DR-31, Questions 1 and 4.

³⁸ SCE RAMP Report, Footnote Number 29, p. 1-32, where climate change is excluded in the ranking because SCE calculated the MARS for climate change differently.

³⁹ SCE RAMP Report, Appendix B.

⁴⁰ SCE RAMP Report, Appendix A.

⁴¹ SCE RAMP Report, Chapter 7.

There is high uncertainty in SCE's estimates of the risks posed by the "extreme wind" driver. This is because over 99% of the MARS for the extreme wind driver is attributed to injury and fatality consequences, through its "building struck by objects" outcome.^{42 43} SCE derived its "building struck by objects" fatality and serious injury outcomes by assuming a once-in-100-years frequency for fatality, and then assumed serious injury are twice as likely to occur.⁴⁴ However, SCE has fortunately never experienced a "building struck by objects" fatality.⁴⁵ In other words, the "extreme wind" driver and "building struck by objects" outcome are highly uncertain because 99% of the expected MARS was derived from a qualitative estimate. Given this high level of uncertainty for "extreme wind," SCE should employ a means

⁴² SCE's RAMP Report, pp. 1-34 to 1-35, where MARS is calculated by scaling the consequences by its assumed maximum range and scaling function, weighting the relative value of the consequence attribute, and multiplying by 100.

The serious injury, fatality, reliability financial consequences have ranges of 0-500, 0-100, 0-2 billion CMI, and 0-\$5 billion, respectively. Serious injury and fatality have square root scaling functions, and reliability and financial have linear scaling functions. All consequence attributes have a 25% weight.

For example, in the Workpapers for the Baseline Risk Assessment (Chapter 4), extreme wind events are estimated to cause the outcome "Building Struck by Objects" 12.19838 times per year. This outcome is estimated to cause, per event, 0.00164 serious injuries, 0.00082 fatalities, no impact on reliability, and \$3,000 in financial impacts. Therefore, the serious injury MARS is approximately $\text{SQRT}(12.19838 * 0.00164 / 500) * 25\% * 100 = 0.158$. Similarly, the fatality MARS is $\text{SQRT}(12.19838 * 0.00082 / 100) * 25\% * 100 = 0.250$, and the financial MARS is $12.19838 * \$3,000 / \$5 \text{ billion} * 25\% * 100 = 0.000183$. As a result, the serious injury and fatality consequence attributes make up over 99.9% of the MARS for the extreme wind driver, if the outcome of this driver was calculated standalone.

As the serious injuries and fatalities consequence categories are scaled by square root functions, the relative MARS contribution of extreme wind towards the serious injuries and fatalities MARS for building safety is actually less than 0.158 and 0.250.

⁴³ Cal Advocates DR-01, Question 01.

Using the information from this Data Request as an example, the 2018 serious injury MARS for building safety was 1.528, from 1.87 injuries, of which 0.020 of the injuries is associated with extreme wind. Therefore, the relative share of MARS for building safety serious injury due to extreme wind events is approximately $0.020 / 1.87 * 1.528 = 0.0167$.

Under a similar calculation, the MARS for fatality due to extreme wind events is approximately 0.078. Nevertheless, even under these values, the MARS resulting from extreme wind events is still dominated by the serious injury and fatality consequence categories (99.8% of the driver's MARS). The actual percentage changes slightly depending on which year is used to calculate the share of MARS due to extreme wind events. Nevertheless, the value does not change significantly enough to falsely conclude that over 99% of the extreme wind MARS attributes to the serious injury and fatality consequence categories.

⁴⁴ SCE RAMP Report Workpapers, pp. 4.1 to 4.4.

⁴⁵ SCE RAMP Report Workpapers, pp. 4.1 to 4.4.

to account for uncertainty for this driver, as described in Public Advocates Office’s general comment in Section A.7, starting with the 2019 GRC.

As explained in the Public Advocates Office’s general comments in Section D.1 above, SCE should have Building Safety metrics that track SCE’s efforts to reduce Building Safety risk, in addition to tracking the Building Safety risk that is actually being reduced. This should start with the 2019 GRC. Currently, none of the four Building Safety metrics that SCE tracks directly measure Building Safety reduction in risk.⁴⁶

One metric that does track actual risk reduction is SCE’s proposed “number of building electrical component failures per year.” By achieving reductions in this metric, SCE will directly reduce the likelihood of the outcomes of electrical system failure: power outages and fires. Moreover, this metric is more useful than only utilizing metrics that only directly track the number of power outages or fires, since both power outages and fires are relatively infrequent outcomes. Instead, by tracking a precursor event that is more likely to occur, SCE can build a robust data set that more accurately predict future levels of risk.

Given the advantages of SCE’s proposed “number of building electrical component failures per year” metric, SCE should also develop similar metrics for its two other building safety drivers: earthquakes and extreme wind.

Currently, SCE assumes that each electrical component has a failure rate of 0.5% per year and does not distinguish whether failure of different components would have different magnitudes of consequences.⁴⁷ SCE should refine this estimate by gathering data to correlate electrical component failure rates with different characteristics. For example, SCE should identify the failure rates and expected consequences for different types of electrical components. SCE should further adjust the assumed failure rate based on the age of the component. This approach will allow SCE to more accurately assess the risk from electrical component failures in

⁴⁶ SCE RAMP Report, p. 4-35.

⁴⁷ SCE RAMP Report Workpapers, pp. 4.1 to 4.4.

the future, as well as allow SCE to target its mitigations towards electrical components that fail more frequently and more catastrophically, and that are approaching end of life.

SCE has incorporated M1: Fire Life Safety Portfolio Assessment in its Proposed Plan despite M1's low RSE of 0.0001.⁴⁸ In responses to data requests, SCE explained it plans to implement M1 because of new jurisdictional requirements that would make M1 a best practice, and because M1 has logistical benefits to future mitigation efforts.⁴⁹ In future RAMP reports, SCE should explain its rationale for any low-RSE mitigations in its Proposed Plan. SCE should also clearly explain all instances when it chooses a mitigation with a lower RSE over a mitigation with a higher RSE. For example, SCE plans to implement M2: Electrical Inspections, which has an RSE of 0.060.⁵⁰ However, SCE does not plan to implement M4: Worker Relocation, which has a higher RSE of 0.127.⁵¹ It was not immediately clear that the reason SCE plans to implement M2, and not M4, is because implementing M4 has feasibility challenges unless SCE also implements M5: Building Replacement, which has a very low RSE of 0.001.⁵²

B. Contact with Energized Equipment

SCE modeled the risk of contact with energized equipment to cover contact by a member of the public with energized overhead distribution primary conductor, whether that conductor is wire-down, or intact.⁵³ The tail average annual average⁵⁴ over 2018-2023 baseline risk has a score of 10.24 with a proposed MRR of 0.93 to achieve a RSE of 0.0029 by spending \$324 million. Comparing to Alternative Plans #1 and #2,⁵⁵ which have cost forecasts of \$338 and

⁴⁸ SCE RAMP Report, p. 4-29.

⁴⁹ Cal Advocates DR-02, Question 07.

⁵⁰ SCE RAMP Report, p. 4-29.

⁵¹ SCE RAMP Report, p. 4-31.

⁵² Cal Advocates DR-02, Question 08.

⁵³ SCE RAMP Report, p. 5-1.

⁵⁴ The tail average in this reflects lower probability but higher consequence risks along a distribution curve.

⁵⁵ The utilities are required to present in their RAMP both the proposed mitigations and also alternative sets of mitigations that were examined but not recommended. In this case these alternative mitigations are referred to as

\$345 million, respectively, the Proposed Plan has the lowest cost forecast amongst the three mitigation plans. Having the lowest cost does not compromise the RSE as Alternative Plans #1 and #2 have comparable RSE scores of 0.0029 and 0.0028 respectively.

SCE has previously recommended increasing use of covered conductor in its proposed Grid Safety and Resiliency Program.⁵⁶ As mentioned in the workpapers,⁵⁷ there exists similarities in the drivers of the two risks of wildfires and contact with energized equipment, but SCE has presented them separately. Learning from M5 mitigation for covered conductor in High-Fire Risk Areas (HFRAs) will increase confidence in implementing targeted and/or complete covered conductor programs to reduce the risk of contact with energized equipment. Assessing data by other utilities regarding areas that experience high contact with energized equipment according to geography, population, and average weather conditions can be utilized to further strengthen SCE's ability to identify and prioritize efficiently circuits that require a covered conductor.

SCE should work with the California Department of Forestry and Fire Protection (CalFire) and the California Governor's Office of Emergency Services (CalOES) to assess areas with overhead electrical equipment that is susceptible to failure on evacuation routes where there is only one significant evacuation route. This analysis should focus on areas with the most vulnerable populations and should be presented in its GRC filing anticipated later this year or in its 2020 Wildfire Mitigation Plan at the latest.

For future RAMP applications, including the Power Safety Power Shutoff (PSPS) in the Contact with Energized Equipment chapter (Chapter 5) will be beneficial to illustrate risks reduced for drivers such as weather and from vegetation in extreme weather cases.

"Alternative Plans".

⁵⁶ SCE's Grid Safety and Resiliency Program Application (A.) 18-09-002.

⁵⁷ SCE RAMP Report, p. 5-6.

C. Cyberattack

SCE modeled the risk of Cyberattack to cover unauthorized access to SCE's system controls, including Supervisory Control And Data Acquisition (SCADA) network, industrial control systems (ICS), and other systems that access and utilize Critical Energy/Electrical Infrastructure Information (CEII).⁵⁸ The tail average annual average over 2018-2023 baseline risk has a score of 11.02 with a proposed Mitigation Risk Reduction (MRR) of 4.56 to achieve a Risk Spend Efficiency (RSE) of 0.057 by spending \$80 million.

SCE's documentation does not clearly present whether the North American Electric Reliability Corporation Critical Infrastructure Protection (NERC CIP) compliance contributes to the controls. SCE listed six controls in Chapter 6 Table III-1.⁵⁹ ⁶⁰ SCE did not clarify whether the six controls are related to the NERC CIP compliance, or are above and beyond what is already required by NERC CIP.

If NERC CIP and any of the six controls are related, then SCE should be directed to clarify this in the controls section and to ensure that there is no financial double counting of capital and Operation and Maintenance (O&M) costs.

There is a compliance measure under the Physical Security chapter (Chapter 9) regarding NERC CIP-003-V6.⁶¹ NERC CIP-003-V6 is Cyber Security in Security Management Controls. This is an apparent double counting of the compliance measure under Physical Security and Cyber Security. If this measure has been double counted, SCE should correct its records.

SCE should be clear when there are related compliance and control measures and the costs and effectiveness for those measures to ensure appropriate accounting and risk reduction. This should be demonstrated starting in the 2019 GRC.

⁵⁸ SCE RAMP Report, p. 6-2.

⁵⁹ SCE RAMP Report, p. 6-20.

⁶⁰ The six controls are C0—Common Cybersecurity Solutions; C1—Perimeter Defense; C2—Interior Defense; C3—Data Protection; C4—SCADA Cybersecurity; and C5—Grid Modernization Cybersecurity.

⁶¹ SCE RAMP Report, p. 9-21.

D. Employee, Contractor, and Public Safety

SCE modeled employee, contractor, and public safety risk to cover acts performed by a SCE employee and/or contractor that lead to an adverse outcome for SCE employees, contractors, or the public. The tail average annual average over 2018-2023 baseline risk has a score of 10.01 with a proposed MRR of 0.41 to achieve a RSE of 0.031 by spending \$13.2 million. Compared to Alternative Plans #1 and #2, which have cost forecasts of \$15.1 and \$13.5 million respectively, the Proposed Plan has the lowest cost forecast amongst the three mitigation plans. Having the lowest cost does not compromise the RSE as Alternative Plans #1 and #2 have RSE scores of 0.031 and 0.032 respectively.

Employee, contractor, and public safety risk illustrates that proficiency with appropriate skills is the basis for operational safety and must not be compromised. In the proposed mitigation plan, SCE opts for the core version of the Safety Culture Transformation, mitigation M1a. However, the Public Advocates Office recommends that SCE implement the expanded training described in mitigation M1b, which includes a two-day in-person safety training program for all employees and supplies electronic tablets to field supervisors for easy access to hazard awareness tools,⁶² rather than the core version of the Safety Culture Transformation in mitigation M1a. In-person training will allow all employees to participate in discussion and engage in safety matters. This will also help increase the overall focus⁶³ on safety which will aid in effectively communicating safety messages. Additionally, expanding the availability of digital information makes more information available than possible through hardcopy materials. As such, electronic tablets provided to field supervisors will reduce investigation and reaction times in hazardous situations.

Safety training provides advantages beyond the obvious legal and financial advantages expected.⁶⁴ With the appropriate safety training, workers are more able to focus on their tasks without worrying about personal safety leading to increased work output and quality.

⁶² SCE RAMP Report, p. 7-26.

⁶³ See, <https://www.yourtrainingedge.com/5-advantages-of-face-to-face-training/>

⁶⁴ Key Benefits of Providing Health and Safety Training for Employees – Wise Global Training Ltd <https://wiseglobaltraining.com/key-benefits-of-providing-health-and-safety-training-for-employees/>

SCE does not track results of acts that do not result in adverse outcomes (near misses) for this program. SCE should evaluate if such actions had the potential of causing adverse outcomes and aim to further study what such actions could be i.e. not following guidelines and cutting corners. Such risks should be measured and assessed to improve safety culture in the workplace.

SCE's risk calculations did not include light injury consequences.⁶⁵ SCE should develop a metric related to such injuries. A light injury could receive a fraction of a serious injury score where numerous light injuries could be regarded as a serious injury. In order to effectively create a safer workplace, which would enable workers to feel safer and in turn retain skills, the maximum amount of risk should be identified.

With regard to data collection and availability,⁶⁶ workers' input should be regarded with increased importance. Rather than having a reactive path of action based on incidents, preventative actions are more beneficial based on field workers' recommendations. This is synonymous with the Safety Observation Program⁶⁷ within the M1a Safety Culture Transformation – core program risk mitigation with the added feature of workers being able to easily provide recommendations based on their own observations. Employees can be rewarded through the Safety Recognition Program for increased safety recommendations and reporting. Furthermore, this can be facilitated by installing software that allows for simple reporting from employee workstations with the added function of anonymity when needed.

In conclusion, data regarding employee actions in the field have the potential to influence actions in the board room. Investing in employees' skills through training should be a priority and emphasized at every opportunity. The Public Advocates Office recommends that SCE select the expanded safety culture transformation training Alternative Plan in risk mitigation M1b, as well as the driver safety training in risk mitigation M4a and include these in SCE's

⁶⁵ SCE RAMP report, p. 7-35.

⁶⁶ SCE RAMP Report, pp. 7-24 and 7-36.

⁶⁷ SCE RAMP Report, p. 7-25.

GRC filing later this year. The other data inputs should be available for use in the next RAMP filing.

E. Hydroelectric Asset Safety

1. Clearer Distinction is Needed between Compliance Activities and Controls

SCE stated that compliance activities for its hydroelectric (hydro) assets “are required to adhere to laws and regulations governing dam safety”⁶⁸ while controls consist of “capital investments necessary for maintaining dam infrastructure and equipment.”⁶⁹

However, it is not clear whether SCE’s dams would still be compliant with laws and regulations or whether its Federal Energy Regulatory Commission’s license for dams would still be renewed should SCE not carry out any of its control activities (e.g. spillway remediation, refurbishing deteriorated concrete, or rehabilitating spillway gate structures, expanding the spillway or armoring embankment dams to allow dams to withstand overtopping of water). Therefore, SCE should further demonstrate that its control measures are indeed above and beyond what laws and regulations already require. This information should be provided in the 2019 GRC filing.

2. Performance Metrics for Dam Safety

SCE's current performance metrics for dam safety consist of the number of high-hazard dam failures,⁷⁰ the number of emergency action plan activations, and the Dam Condition Ratings by the California Department of Water Resources Division of Safety of Dams.⁷¹ As SCE noted, one of the challenges associated with dam safety is that “there is no direct data on failure rates to

⁶⁸ SCE RAMP Report, p. 8-21.

⁶⁹ SCE RAMP Report, p. 8-21.

⁷⁰ SCE RAMP Report, p. 8-1.

The hazard classification of dams is based on the “potential downstream impacts to life and property should the dam fail when operating with a full reservoir, as defined in the Federal Guidelines for Inundation Mappings of Flood Risk Associated with Dam Incidents and Failures (FEMA P-946, July 2013). A classification of “High” is given for a dam where one or more fatalities would be expected.”

⁷¹ SCE RAMP Report, p. 8-41.

draw from. This is because SCE has not experienced a dam failure comparable to those discussed in this chapter.”⁷² Additionally, SCE notes that dam failure risks are generally very rare but with catastrophic consequences,⁷³ and that SCE draws from the lesson learned from the Oroville Spillway incident in Northern California.⁷⁴

The lack of prior dam failure events, and therefore a dam failure rate, indicates that field investigation and numerical simulations of dam structure⁷⁵ would better inform the risk of these high-hazard dams. As a starting point, SCE should work on asset-specific numerical simulation and structural health monitoring of its 28 high hazard dams. This information should be provided in the next RAMP filing.

F. Physical Security

SCE modeled the risk of physical security to cover the security perimeter of SCE facilities that are protected by physical security measures. This includes structures such as office buildings, substations, switching centers, grid control centers, data centers, electricity generation facilities, IT facilities, warehouses and service centers.⁷⁶ The tail average annual average for the 2018-2023 baseline risk has a score of 14.16 with a proposed mitigation plan’s risk reduction (MRR) of 6.98 to achieve a RSE of 0.108 by spending \$65 million.

SCE is not clear whether the NERC CIP compliance contributes to the controls. SCE listed four controls in Chapter 9 Table III-1.^{77 78} SCE did not clarify whether the four controls are related to the NERC CIP compliance or are above and beyond what is already required by NERC CIP.

⁷² SCE RAMP Report, p. 8-39.

⁷³ SCE RAMP Report, p. 8-39.

⁷⁴ SCE RAMP Report, pp. 8-39 to 8-41.

⁷⁵ SCE RAMP Report, p. 8-39.

⁷⁶ SCE RAMP Report, p. 9-3.

⁷⁷ SCE RAMP Report, p. 9-20.

⁷⁸ The four controls are C1—Grid Infrastructure Protection; C2—Protection of Generation Capabilities; C3—Non-electric Facilities/Protection of Major Business Functions; and C4—Asset Protection.

If NERC CIP and any of the four controls are related, then it should be clarified in the controls section for this risk to ensure that there are no financial double counting costs of capital and O&M sides.

The control measure 2 (NERC CIP-003-V6) is Cyber Security in Security Management Controls.

This is an apparent double counting of the compliance measure under Physical Security and Cyber Security. SCE should identify related compliance and control measures and the costs and effectiveness for those measures to ensure appropriate accounting and risk reduction.

G. Wildfire

The Wildfire risk has a 6.9 mean-average MARS score, the 3rd highest ranked risk. Wildfire is the first ranked risk in the tail-end average with a 24 MARS score.^{79 80} It is worth noting that Contact with Energized Equipment, ranked 1st in the mean-average scenario, is a major driver for ignitions and wildfire risk.⁸¹

SCE developed the drivers presented in the RAMP Report by obtaining ignition data associated with SCE equipment in a High Fire Threat Area (HFRA).⁸² While this approach allows SCE to determine the issues in a HFRA, it misses the opportunity to look at SCE assets comprehensively. By excluding areas adjacent to non-HFRAs and incidents that did not result in ignition from its analysis,⁸³ SCE missed the opportunity to affirm its current drivers or identify other potential root causes. By excluding non-HRFA events, SCE does not analyze a large amount of the available data⁸⁴ to determine other issues that could potentially cause a wildfire, such as other equipment problems, because it did not analyze the majority of its

⁷⁹ The top three risks by the MARS Tail-Average Score are (24) *Wildfire*; (14) *Physical Security*; and (12) *Cyber Attack*.

⁸⁰ Top 3 risks by MARS Mean-Average Score: (7.9) *Contact with Energized Equipment*; (7) *Employee, Contractor and Public Safety*; and (6.9) *Wildfire*.

⁸¹ SCE RAMP Report, p. 1-34.

⁸² SCE RAMP Report, p. 10-8.

⁸³ SCE RAMP Report, p. 10-8.

⁸⁴ SCE non-HRFA is roughly 65% of SCE's total territory.

territory. A comprehensive approach can help identify a trend among equipment issues or incidents that may have been missed in SCE's current analysis. Moreover, a category of "similar incidents" should be considered (i.e. object contact with wires that did not cause an ignition).⁸⁵ This should be addressed in the 2019 GRC filing.

Driver 4 is listed as Unknown/Unspecified. While some events cannot be identified, SCE should explain in future RAMP filings the guidelines and efforts its staff follow to ensure the events and incidents are properly classified.

In its analysis, SCE draws data from CalFire's published statistics that include wildfire events that occurred inside and outside of SCE's service territory but within the state of California.⁸⁶ Without more detailed information,⁸⁷ SCE's approach can have varying effects. At first glance, the unspecified information gathered from outside of SCE's territory gives SCE more data to develop more accurate drivers and build a more robust case. However, it is not clear how SCE considered information regarding territory climate and topography of the events and how that applies to SCE. The Public Advocates Office recommends that the Commission, along with CalFire,⁸⁸ host a workshop this year to assess if there is more valuable data granularity that can be utilized by California's electric utilities.⁸⁹ A workshop this year will allow any new information or conclusions to be utilized for the 2020 fire season.

The Public Advocates Office recommends SCE include further discussion and clarifications regarding the following issues as part of its GRC filing later this year:

⁸⁵ This incident can be categorized as a "near miss" since ignition didn't happen because of conditions independent of the equipment.

⁸⁶ SCE RAMP Report, p. 10-17.

⁸⁷ For example, how the data gathered from a different territory compares to SCE's territory. Further details can be identified in the proposed CPUC-CalFire workshop to determine more valuable data granularity that can be used by California utilities.

⁸⁸ Consistent with the Memorandum of Understanding between CalFire and the Commission. *See*, https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Safety/170907%20CPUC-CAL%20FIRE%20MOU%20FINAL%20SIGNED.pdf

⁸⁹ In the Comments on PG&E's 2017 RAMP filing (I.17-11-003), the Public Advocates Office requests an increase of granularity to better account for risk profiles. Therefore, a workshop hosted by SED can help determine the level of data granularity necessary for assessment by electric utilities. *See*, <http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M223/K646/223646833.PDF>

1. Tree Attachments, specifically for the 2019 and 2020 fire seasons;
2. Public Safety Power Shutoff (PSPS) strategy;
3. Fire Spreading;
4. Overhead Conductor Program.

First, tree attachments⁹⁰ present a wildfire risk.⁹¹ It is indispensable for SCE to describe its strategy to mitigate fire risk while the replacement process is being implemented. Second, the PSPS strategy was included as a mitigation practice. Explicit language, however, stating that PSPS will be a “last resort” practice was absent. Additionally, SCE does not acknowledge how the Commission’s ongoing Rulemaking,⁹² will affect the PSPS mitigation proposed in the RAMP Report. Third, the wildfire chapter largely focuses in preventing ignitions associated with SCE equipment, fire hardening, etc. but it does not elaborate on what measures SCE will take to prevent a fire from spreading. Wildfires are driven by wind and fuel load, therefore, it would be beneficial for SCE to address what strategies it currently has in place, as well as how it is working with local communities and other governmental agencies to address the riskiest areas in SCE territory. Lastly, SCE should include mitigations efforts SCE will engage in while fire hardening of SCE equipment in the Overhead Conductor Program is completed.

SCE separates outcomes into four different categories⁹³ and continues to assess impacts using four consequences: Serious Injury, Fatality, Reliability, and Financial. The Public Advocates Office agrees with the Safety and Enforcement Division’s (SED) assessment that more consequences should be added as the current ones do not encompass all the implications carried by wildfires, such as acres burned, structures destroyed, structures damaged and secondary disasters that accompany wildfires such as mudslides and mitigations.⁹⁴ ⁹⁵

⁹⁰ SCE’s RAMP Report states SCE has approximately 1,640 tree attachments in its HRFA.

⁹¹ “Conductor installed on a tree is vulnerable due to its close contact with the tree and the risk that the tree will die. A dead tree can fall and is more susceptible to burning.” SCE RAMP Report, p. 10-31.

⁹² R.18-12-005 to Examine Electric Utility De-Energization of Power Lines in Dangerous Conditions.

⁹³ See, SCE RAMP Report, p. 10-8. RAMP Report Outcome 1: Wildfire, RFW, >5000 acres; Outcome 2: Wildfire, RFW, < 5000; Outcome 3: Wildfire, No RFW, >5000; and Outcome 4: Wildfire, No RFW, <5000.

⁹⁴ SED SCE RAMP Comments, p. 75.

⁹⁵ SED SCE RAMP Comments, p. 43, which covers mudslide mitigation after wildfire incidents.

The Alternative Plans presented in this Report need improvement and more sophistication from SCE. Specifically, Alternative Plan #2 was not properly crafted to be a viable alternative. While the Proposed Plan and Alternative Plan #1 are similar, the mitigations differ in that the Proposed Plan includes more covered conductor for mitigations and costs of \$1,609 and \$1,372 million, respectively. This allows for effective comparison parameters, including RSE while Alternative Plan #2 does not allow for a fair comparison. For example, Alternative Plan #2 mitigation strategies consist of microgrids, bare + covered conductor, and undergrounding.⁹⁶⁹⁷ Replacing 1,492 miles of overhead conductors with undergrounding will cost nearly \$5.8 billion, yet, SCE made no adjustments on the costs of affected strategies proposed.⁹⁸⁹⁹ For example, SCE should have identified why there is no reduction in the costs for enhanced vegetation management when over half of the overhead conductors are eliminated through undergrounding. Undergrounding can also be utilized as a targeted measure, rather than widespread, to create a more viable Alternative Plan #2. Additionally, as in Appendix 1,¹⁰⁰ SCE should provide an analysis of long-term benefits and changed risks¹⁰¹ of undergrounding to see the full set of benefits this strategy provides. Undergrounding is expensive and increases other risks, such as longer times to repair and restore service. Nonetheless, given the current fire risk in California and the fact that undergrounding addresses all the drivers identified,¹⁰² all California utilities must be required to provide viable mitigation measures including undergrounding.

⁹⁶ Alternative Plan Number 2 proposes 1,498 miles of undergrounding.

⁹⁷ SCE RAMP Report, p. 10-54, Table VII-1.

⁹⁸ M2: Remote-Controlled Automatic Reclosers and Fast Curve Settings, M3: PSPS Protocol and Support Functions, M4: Infrared Inspection Program, M5: Expanded Vegetation Management, M7: Enhanced Situational Awareness and M8: Fusing Mitigation.

⁹⁹ Microgrids proposed address PSPS.

¹⁰⁰ SCE RAMP Report, p. 10-50, Appendix 1: Long Term Analysis of M1 – Wildfire Covered Conductor Program.

¹⁰¹ For example, while undergrounding can reduce the risk of wildfires, undergrounding increases outage durations when an outage occurs due to a problem with the undergrounded line.

¹⁰² SCE RAMP Report, Table IV-1 – Inventory of Mitigations, p. 10-28.

Lastly, the metrics presented can be improved to reflect outcomes rather than tasks in the 2019 GRC filing.¹⁰³ While there is a benefit to tracking how much work was performed, the goals and objectives of wildfire mitigation is to lower the risk of fires, which outcome-based metrics will reflect.

H. Underground Equipment Failure

The Public Advocates Office agrees with SED's concern that the proposed mitigations do not show specific details on locations and how the proposed mitigations would be implemented. Therefore, it is difficult to assess whether the proposed mitigations address the most vulnerable sections of SCE's underground distribution system.¹⁰⁴ This information should be provided in the 2019 GRC filing.

I. Climate Change

The risk of Climate Change has a baseline MARS of 4.53.¹⁰⁵ The baseline MARS, however, is not comparable to the other risks because it was calculated differently.¹⁰⁶ The total spend proposed for climate change from 2018-2023 is \$83.2 million. This risk is defined as impacts of climate change, and SCE's resiliency measures to reduce the impacts. It does not cover methods to mitigate climate change by reducing greenhouse gas (GHG) emissions.

As explained in Section D.1 above, SCE should have performance metrics that track not only that SCE is taking efforts to reduce risk, but also that the risk is actually being reduced. For example, SCE could track the estimated dollars saved in energy procurement costs from

¹⁰³ SCE RAMP Report, pp. 10-58, where the metrics "Covered Conductor Installed in HFRA" and "Branch Line Fusing in HFRA" are largely task oriented metrics.

¹⁰⁴ SED SCE RAMP Comments, pp. 49 and 50.

¹⁰⁵ SCE RAMP Report, p. 1-32.

¹⁰⁶ SCE RAMP Report, Footnote Number 29, p. 1-32, states:

"...the risks associated with climate change are impactful to varying degrees over the near-, medium-, and long-term time horizons. This RAMP analysis reflects impacts over the 2018-2023 RAMP period. We were not able to capture the gradual and long-term impacts, such as drought, snowpack, sea-level rise, etc. over the near-term using the RAMP model. (2) In the RAMP analysis, SCE modeled the near-term extreme (99th percentile) climate change risks (extreme rain, heat, and wildfire). This means that the climate change results shown are much further on the distribution of outcomes than the tail-average results shown for the other eight risks. As such, the comparison is not entirely like-for-like."

M1: Climate Adaptation & Severe Weather Program. This should be addressed in the 2019 GRC filing.

For the driver “Extreme Wildfire Events,” SCE has only quantified the effects of wildfires that are at least 300 acres, rather than quantifying the effects of all wildfires.¹⁰⁷ At minimum, SCE should perform a rough calculation to ensure that these smaller wildfires do not have impacts of the same magnitude as the 300+ acre wildfires considered in SCE’s analysis. If these smaller wildfires do have equal or greater risk impacts as the larger wildfires, SCE can account for the impacts of these small wildfires by applying a correction factor to its overall “extreme wildfire event” MARS, rather than calculating the impacts of each individual small fire. For example, if SCE estimates that small fires have approximately 10% of the risk of 300+ acre fires and has already calculated the MARS for 300+ acre fires as 1.0, then SCE could estimate the total MARS for this driver is 1.1.¹⁰⁸ This should be addressed as part of SCE’s 2020 Wildfire Mitigation Plan.

Currently, SCE lists “Increased Major Weather Events” and “Increased Catastrophic Weather Events” as outcomes, yet these two appear closer to “drivers”, i.e. “the fundamental elements contributing to the risk event”, rather than “outcomes”.^{109, 110} Rather, the outcomes from “Increased Major Weather Events” and “Increased Catastrophic Weather Events” appear to be “damaged transmission and distribution assets, telecommunications equipment, or operational facilities”, and “significant outage days”.¹¹¹ SCE should reevaluate its categorization of “outcomes” in this chapter and ensure its categorization here is consistent with its usage in other chapters. This should be addressed in the next RAMP filing.

For SCE’s M2: Situational Awareness, Monitoring, & Analytics, SCE currently only focuses on the benefits this mitigation could have to reduce consequences from wildfires.¹¹²

¹⁰⁷ SCE’s RAMP Report, p. 12-16.

¹⁰⁸ This is an illustrative example.

¹⁰⁹ SCE RAMP Report, p. 12-8.

¹¹⁰ SCE RAMP Report, p. 1-14.

¹¹¹ SCE RAMP Report, p. 12-19.

¹¹² SCE RAMP Report, pp. 12-31 to 12-35.

However, the weather stations installed for this mitigation may have additional benefits for situational awareness of major and catastrophic weather events. SCE should consider the additional benefits of this mitigation towards reducing consequences and risk from other events, if SCE has not already done so, and quantify the benefits if the consequences and risks are found to be significant.

Currently, SCE has not developed a plan for climate change mitigation measures beyond 2023 but has done preliminary analysis on the need for long-term mitigations.¹¹³ Because the impacts of climate change are long term, SCE should continue to perform analysis on the need for long-term mitigations. SCE should also identify if and how its applications for new or upgraded electrical infrastructure that necessitate Certificates of Public Convenience and Necessity (CPCNs) and Permits to Construct (PTCs) address long-term considerations for climate change that can inherently reduce the risk profile of the new projects.

Given the long-term impacts of climate change, the Public Advocates Office's general comment in Section B.2 on needing to quantify the benefits of long-life mitigations is especially important here.

These issues should be addressed in SCE's next RAMP filing.

SCE's regression equations to predict the number of rain events, heat events, and wildfires caused by climate change have R^2 values of 0.0887, 0.0072, and 0.0010 respectively.¹¹⁴ Given these low R^2 values, the Public Advocates Office's general comment in Section A.7 on needing to take measures to account for uncertainty is especially important here.¹¹⁵

SCE should provide more granular information regarding the outcomes of climate change events. For example, in Chapter 12 Appendix 1's Near-, Medium-, and Long-term (2018-2050) Climate Change Vulnerability and Impact Assessment ("Impact Assessment"), SCE breaks

¹¹³ Cal Advocates DR-02, Question 09.

¹¹⁴ SCE RAMP Report, Chapter 12 – "D1-Extreme Rain Events", "D2-Extreme Heat Events", and "D3-Extreme Wildfire Events" workpapers, under the "Regression and Predictive Values" tab.

¹¹⁵ A R^2 value is a statistical measure that reflects how much variance in a dependent variable is reflected by an independent variable in a regression model. A high R^2 value means that much of the variance is explained, while a low R^2 value means little of the variance is explained.

down the impacts of flooding damage into categories for infrastructure, IT, transmission and distribution, hydro, and workforce.¹¹⁶ However, this analysis is absent in SCE’s RAMP analysis. SCE should incorporate this type of analysis that produces more granular information in future RAMP reports.

As mentioned in the Public Advocates Office’s general comments in Section A.3, SCE should be transparent when it elects to use data sources from different date ranges. For example, for the major weather event outcome, the serious injury consequence draws data from 2015-2017, whereas for reliability and financial consequences used data from 2014-2017.¹¹⁷ It is not clear whether these different year ranges are due to lack of data for major weather event serious injury in 2014, or whether there was a specific reason to exclude the 2014 data.

Finally, it is not clear whether SCE’s RAMP Report considers the following four risk factors and mitigation measures that were considered in SCE’s 2016 Climate Impact Analysis and Resilience Planning Report (“Resilience Report”):

1. Both the Resilience Report and SCE’s Chapter 12 Appendix 1 Impact Assessment state that the higher average temperatures projected from climate change will reduce generation system efficiency.¹¹⁸ SCE’s RAMP Report appears to only consider the need for increased energy procurement from extreme heat events, and not also the additional procurement from year-round increased temperatures leading to year-round reduced generation system efficiency.¹¹⁹
2. It is not clear whether in SCE’s RAMP Report, SCE considered increased use of distributed energy resources to mitigate climate change-related risks on the transmission system.¹²⁰

¹¹⁶ SCE RAMP Report, pp. 12-52 to 12-53.

¹¹⁷ SCE RAMP Report, p. 12-19.

¹¹⁸ See SCE RAMP Report Workpapers, 2016 Climate Impact Analysis and Resilience Planning Report p. 3; and Near-, Medium-, and Long-term (2018-2050) Climate Change Vulnerability and Impact Assessment, pp. 12-50 to 12-51.

¹¹⁹ SCE RAMP Report Workpapers, Chapter 12, WP Ch. 12-D3–Extreme Heat Events Workpaper.

¹²⁰ See SCE RAMP Report Workpapers, 2016 Climate Impact Analysis and Resilience Planning Report, p. 3.

3. It is not clear how SCE's RAMP considers "design[ing] new facilities and equipment utilizing future modeling instead of historical data."¹²¹
4. SCE's Impact Assessment considers the impacts of climate change on an individual facility-specific level.¹²² However, SCE's RAMP Report appears to only consider the impacts of climate change on a general, service territory-wide level. In the future RAMP reports, SCE should incorporate facility-specific risk calculations into its RAMP. This will allow SCE to model how climate change risks may affect certain facilities to a greater degree than others. This in turn will allow SCE to target its mitigations towards its greatest risk facilities. For example, SCE could combine its data on facility-specific characteristics with its data on heat event locations to identify the facilities most affected by the "extreme heat event" and "extreme wildfire event" drivers.¹²³ SCE could then focus the asset hardening efforts in its proposed M1: Climate Adaptation & Severe Weather Program mitigation on these greatest affected facilities.

SCE should more closely tie in analysis from its Resilience Reports in the future into its RAMP analysis, to ensure that future RAMP Climate Change chapters are as robust as possible. SCE should perform this increased quantitative analysis in the next RAMP filing.

J. Nuclear Decommissioning

This risk is defined as the safety risks associated with the decommissioning process of the San Onofre Nuclear Generating Station (SONGS). Risks associated with this RAMP appendix chapter include spent fuel pool operational risks, fuel transfer operations risks, the risks related to the Independent Spent Fuel Storage Installation (ISFSI), security risks, and industrial safety risks. This RAMP appendix chapter covers only a qualitative rather than quantitative evaluation of the SONGS decommissioning safety risks.

¹²¹ See SCE RAMP Report Workpapers, 2016 Climate Impact Analysis and Resilience Planning Report, p. 3.

¹²² See SCE RAMP Report Workpapers, 2016 Climate Impact Analysis and Resilience Planning Report, pp. 6-7.

¹²³ See SCE RAMP Report Workpapers, 2016 Climate Impact Analysis and Resilience Planning Report, p. 9.

Recent design change issues by Holtec International resulted in a flaw in the design of spent fuel canisters which led to the Nuclear Regulatory Commission (NRC) imposing a \$116,000 fine on SCE.¹²⁴ Such events could be pre-requisites to radioactivity release and should be addressed not only as an environmental risk in the next RAMP filing.

The Public Advocates Office understands that the NRC exercises jurisdiction over the nuclear and radiological safety aspects of nuclear energy generation including the decommissioning of licensed nuclear reactor facilities.¹²⁵ However, SCE should include in future RAMP reports, the funding needed to address and subsequently mitigate risks encountered during the decommissioning process as well as costs associated with hiring third-party entities such as the Decommissioning General Contractor (DGC) and Holtec International.

Finally, given the lack of description of drivers and performance metrics in this chapter, the Public Advocates Office's general comment in Section D.3 that the Appendix Chapters should follow similar structure to SCE's main chapter is applicable here.

K. Transmission and Substation Assets

This risk is defined as risks associated with transmission, sub-transmission, and substation assets not covered in the nine RAMP risk chapters. Risks associated with this RAMP Appendix Chapter include transmission line clearances, conductor attachment failure, transmission line structure failure, substation transformer failure, and substation circuit breaker failure. This RAMP Appendix Chapter only covers a qualitative evaluation transmission and substation asset risks, and lacks a quantitative evaluation of these risks.

In future RAMP reports, SCE should make a clearer distinction between measures it proposes as controls (i.e. what SCE is already doing) and measures it proposes as mitigations (i.e. additional measures). For example, SCE states it plans to replace transmission conductors

¹²⁴ SCE was fined, in March 2019 by the US Nuclear Regulatory Commission, for SCE's handling of nuclear spent fuel canisters. See, <https://www.vcstar.com/story/news/2019/03/26/edison-fined-its-handling-nuke-canisters/3282730002/>

¹²⁵ SCE RAMP Report, p. A-3.

through its Transmission Infrastructure Replacement program.¹²⁶ It is unclear whether SCE plans to perform this work at its routine replacement schedule, or whether SCE is proposing to accelerate replacement of these transmission conductors in its RAMP filing.

It is not clear whether SCE has considered the effects of climate change as it relates to this chapter. One of the potential impacts of climate change is increased ambient temperatures that will lead to greater sag in transmission lines.¹²⁷ This greater sag from higher temperatures could be a driver to SCE’s “Transmission Line Clearance” sub risk, yet SCE makes no mention of line sag from higher temperatures in this chapter. SCE should make sure to consider the effects of line sag from higher temperatures as it relates to this chapter, as well as how other risks interact with this risk, in its future RAMP filings.

Finally, given the lack of descriptions for drivers and performance metrics in this chapter, the Public Advocates Office’s general comment in Section D.3 that the Appendix Chapters should follow similar structure to SCE’s main chapter is applicable here.

V. CONCLUSION

The Public Advocates Office agrees with SED and other parties that the RAMP process is an evolving process that should benefit from continued evaluation and improvement. The Public Advocates Office recommends that SCE perform the analyses and proposed changes as identified in these comments.

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¹²⁶ SCE RAMP Report, p. B-8.

¹²⁷ US Department of Energy’s Climate Change and the U.S. Energy Sector: Regional Vulnerabilities and Resilience Solutions, pp. 3-10. *See*, https://www.energy.gov/sites/prod/files/2015/10/f27/Regional_Climate_Vulnerabilities_and_Resilience_Solutions_0.pdf.

Respectfully submitted,

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